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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 223 and 224

[Docket No. 160614518-6518-01]

RIN 0648-XE685

Endangered and Threatened Wildlife; 90-Day Finding on a Petition to List Chambered Nautilus as Threatened or Endangered Under the Endangered Species Act

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce.

ACTION: 90-day petition finding, request for information.

SUMMARY: We, NMFS, announce a 90-day finding on a petition to list the chambered nautilus (*Nautilus pompilius*) as a threatened species or an endangered species under the Endangered Species Act (ESA). We find that the petition, along with information readily available in our files, presents substantial scientific or commercial information indicating that the petitioned action may be warranted. We will conduct a status review of this species to determine whether the petitioned action is in fact warranted. To ensure that the status review is comprehensive, we are soliciting scientific and commercial information pertaining to the chambered nautilus from any interested party.

DATES: Information and comments on the subject action must be received by *[insert date 60 days after date of publication in the FEDERAL REGISTER]*.

ADDRESSES: You may submit comments, information, or data on this document, identified by the code NOAA-NMFS-2016-0098, by either of the following methods:

- *Electronic Submissions:* Submit all electronic public comments via the Federal eRulemaking Portal. Go to www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2016-0098. Click the “Comment Now” icon, complete the required fields, and enter or attach your comments.
- *Mail:* Submit written comments to Maggie Miller, NMFS Office of Protected Resources (F/PR3), 1315 East West Highway, Silver Spring, MD 20910, USA.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS.

All comments received are a part of the public record and will generally be posted for public viewing on www.regulations.gov without change. All personal identifying information (e.g., name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter "N/A" in the required fields if you wish to remain anonymous).

Copies of the petition and related materials are available on our website at

<http://www.fisheries.noaa.gov/pr/species/invertebrates/chambered-nautilus.html>.

FOR FURTHER INFORMATION CONTACT: Maggie Miller, Office of Protected Resources, 301-427-8403.

SUPPLEMENTARY INFORMATION:

Background

On May 31, 2016, we received a petition from the Center for Biological Diversity to list the chambered nautilus (*N. pompilius*) as a threatened species or an endangered species under the ESA. Copies of the petition are available upon request (see **ADDRESSES**).

ESA Statutory, Regulatory, and Policy Provisions and Evaluation Framework

Section 4(b)(3)(A) of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq.*), requires, to the maximum extent practicable, that within 90 days of receipt of a petition to list a species as threatened or endangered, the Secretary of Commerce make a finding on whether that petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted, and to promptly publish such finding in the **Federal Register** (16 U.S.C. 1533(b)(3)(A)). When it is found that substantial scientific or commercial information in a petition indicates the petitioned action may be warranted (a “positive 90-day finding”), we are required to promptly commence a review of the status of the species concerned during which we will conduct a comprehensive review of the best available scientific and commercial information. In such cases, we conclude the review with a finding as to whether, in fact, the petitioned action is warranted within 12 months of receipt of the petition. Because the finding at the 12-month stage is based on a more thorough review of the available information, as compared to the narrow scope of review at the 90-day stage, a “may be warranted” finding does not prejudice the outcome of the status review.

Under the ESA, a listing determination may address a species, which is defined to also include subspecies and, for any vertebrate species, any distinct population segment (DPS) that interbreeds when mature (16 U.S.C. 1532(16)). Because the chambered

nautilus is an invertebrate, the DPS option does not apply. Under the ESA, a species or subspecies is “endangered” if it is in danger of extinction throughout all or a significant portion of its range, or “threatened” if it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range (ESA sections 3(6) and 3(20), respectively, 16 U.S.C. 1532(6) and (20)). Pursuant to the ESA and our implementing regulations, we determine whether species are threatened or endangered based on any one or a combination of the following five section 4(a)(1) factors: the present or threatened destruction, modification, or curtailment of habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; inadequacy of existing regulatory mechanisms; and any other natural or manmade factors affecting the species’ existence (16 U.S.C. 1533(a)(1), 50 CFR 424.11(c)).

ESA-implementing regulations issued jointly by NMFS and the U.S. Fish and Wildlife Service (50 CFR 424.14(b)) define “substantial information” in the context of reviewing a petition to list, delist, or reclassify a species as the amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted. In evaluating whether substantial information is contained in a petition, we must consider whether the petition: (1) Clearly indicates the administrative measure recommended and gives the scientific and any common name of the species involved; (2) contains detailed narrative justification for the recommended measure, describing, based on available information, past and present numbers and distribution of the species involved and any threats faced by the species; (3) provides information regarding the status of the species over all or a significant portion of its range; and (4) is

accompanied by the appropriate supporting documentation in the form of bibliographic references, reprints of pertinent publications, copies of reports or letters from authorities, and maps (50 CFR 424.14(b)(2)).

At the 90-day finding stage, we evaluate the petitioners' request based upon the information in the petition including its references considered together with the information readily available in our files. We do not conduct additional research, and we do not solicit information from parties outside the agency to help us in evaluating the petition. We will accept the petitioners' sources and characterizations of the information presented if they appear to be based on accepted scientific principles, unless we have specific information in our files that indicates the petition's information is incorrect, unreliable, obsolete, or otherwise irrelevant to the requested action. Information that is susceptible to more than one interpretation or that is contradicted by other available information will not be dismissed at the 90-day finding stage, so long as it is reliable and a reasonable person would conclude it supports the petitioners' assertions. In other words, conclusive information indicating the species may meet the ESA's requirements for listing is not required to make a positive 90-day finding. We will not conclude that a lack of specific information alone precludes a positive 90-day finding if a reasonable person would conclude that the unknown information itself suggests an extinction risk of concern for the species at issue.

To make a 90-day finding on a petition to list a species, we evaluate whether the petition presents substantial scientific or commercial information indicating the subject species may be either threatened or endangered, as defined by the ESA. First, we evaluate whether the information presented in the petition, along with the information readily

available in our files, indicates that the petitioned entity constitutes a “species” eligible for listing under the ESA. Next, we evaluate whether the information indicates that the species faces an extinction risk that is cause for concern; this may be indicated in information expressly discussing the species’ status and trends, or in information describing impacts and threats to the species. We evaluate any information on specific demographic factors pertinent to evaluating extinction risk for the species (e.g., population abundance and trends, productivity, spatial structure, age structure, sex ratio, diversity, current and historical range, habitat integrity or fragmentation), and the potential contribution of identified demographic risks to extinction risk for the species. We then evaluate the potential links between these demographic risks and the causative impacts and threats identified in section 4(a)(1).

Information presented on impacts or threats should be specific to the species and should reasonably suggest that one or more of these factors may be operative threats that act or have acted on the species to the point that it may warrant protection under the ESA. Broad statements about generalized threats to the species, or identification of factors that could negatively impact a species, do not constitute substantial information indicating that listing may be warranted. We look for information indicating that not only is the particular species exposed to a factor, but that the species may be responding in a negative fashion; then we assess the potential significance of that negative response.

Many petitions identify risk classifications made by nongovernmental organizations, such as the International Union for Conservation of Nature (IUCN), the American Fisheries Society, or NatureServe, as evidence of extinction risk for a species. Risk classifications by other organizations or made under other Federal or state statutes

may be informative, but such classification alone may not provide the rationale for a positive 90-day finding under the ESA. For example, as explained by NatureServe, their assessments of a species' conservation status do “not constitute a recommendation by NatureServe for listing under the U.S. Endangered Species Act” because NatureServe assessments “have different criteria, evidence requirements, purposes and taxonomic coverage than government lists of endangered and threatened species, and therefore these two types of lists should not be expected to coincide”

(<http://www.natureserve.org/prodServices/pdf/NatureServeStatusAssessmentsListing-Dec%202008.pdf>). Additionally, species classifications under IUCN and the ESA are not equivalent; data standards, criteria used to evaluate species, and treatment of uncertainty are also not necessarily the same. Thus, when a petition cites such classifications, we will evaluate the source of information that the classification is based upon in light of the standards on extinction risk and impacts or threats discussed above.

Taxonomy of the Petitioned Chambered Nautilus

The petition notes that the taxonomy of the nautiloids is controversial. Based on the Integrated Taxonomic Information System, which has a disclaimer that it “is based on the latest scientific consensus available . . . [but] is not a legal authority for statutory or regulatory purposes,” there are presently five recognized species within the genus *Nautilus*: *N. belauensis* (Saunders, 1981), *N. macromphalus* (Sowerby, 1849), *N. pompilius* (Linnaeus, 1758), *N. repertus* (Iredale, 1944), and *N. stenomphalus* (Sowerby, 1849). However, a review and analysis of recent genetic and morphological data suggests that perhaps only two of these five species are valid: *N. pompilius* and *N. macromphalus*, with the other three species more parsimoniously placed within *N.*

pompilius (Ward *et al.*, 2016). While the taxonomy of the *Nautilus* genus may not be fully resolved, we find that the information provided by the petitioner and readily available in our files presents substantial scientific or commercial information indicating that the petitioned entity, *N. pompilius*, constitutes a valid “species” and is thus is a type of entity that may be eligible for listing under the ESA.

Range, Distribution and Life History

The chambered nautilus is found in tropical, coastal reef, deep-water habitats of the Indo-Pacific. Its known range includes waters off American Samoa, Australia, Fiji, India, Indonesia, Malaysia, New Caledonia, Papua New Guinea, Philippines, Solomon Islands, and Vanuatu, and it may also potentially occur in waters off China, Myanmar, Western Samoa, Thailand, and Vietnam (Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 2016). Within its range, the chambered nautilus has a patchy distribution and is unpredictable in its area of occupancy. Based on multiple research studies, the presence of suitable habitat on coral reefs does not necessarily indicate the likelihood of chambered nautilus occurrence (CITES 2016). Additionally, the chambered nautilus is limited in its horizontal and vertical distribution throughout its range due to physiological constraints.

Physiologically, the chambered nautilus cannot tolerate temperatures above approximately 25°C or depths exceeding around 750 – 800 meters (m) (Ward *et al.*, 1980; Carlson 2010). At depths greater than 800 m, the hydrostatic pressure will cause the shell of the nautilus to implode, thereby killing the animal (Ward *et al.*, 1980). Based on these physiological constraints, the chambered nautilus is considered to be an extreme habitat specialist, found in association with steep-sloped forereefs with sandy, silty, or

muddy-bottomed substrates. Within these habitats, the species ranges from around 100 m depths (which may vary depending on the water temperature) to around 500 m depths (CITES 2016). The chambered nautilus does not swim in the open water column (likely due to its vulnerability to predation), but rather remains near the reef slopes and bottom substrate, and thus can be best characterized as a nekto-benthic or epibenthic species (Barord *et al.*, 2014; CITES 2016).

Chambered nautilus are described as deep-sea scavenging generalists and opportunistic predators. They have up to 90 retractable appendages, or tentacles, that they use to dig in the substrate and feed on a variety of organisms, including fish, crustaceans, echinoids, nematodes, cephalopods, other marine invertebrates, and detrital matter (Saunders and Ward 2010). The chambered nautilus also has an acute sense of olfaction and can easily smell odors (such as prey) from significant distances (Basil *et al.*, 2000).

The general life history characteristics of the chambered nautilus are that of a rare, long-lived, late-maturing, and slow-growing marine invertebrate species, with likely low reproductive output. Circumferential growth rate for the chambered nautilus has been estimated to range from 0.053 mm/day to 0.23 mm/day, with growth rates slowing as the animal approaches maturity (Dunstan *et al.*, 2010; Dunstan *et al.*, 2011b); however, overall shell size appears to vary among regions, with smaller shell diameters (170-180 mm) noted around Fiji and the Philippines (Tanabe *et al.*, 1990), and larger diameters (up to 222 mm) off Western Australia. Additionally, the species exhibits sexual dimorphism, with males consistently growing to larger sizes than females (Saunders and Ward 2010). Males also tend to dominate the sex ratios in populations, with observed proportions ranging from 69 to 95 percent in observed populations (Saunders and Ward 2010).

Chambered nautilus longevity is at least 20 years, with age to maturity between 10 and 17 years (Dunstan *et al.*, 2011b; Ward *et al.*, 2016). Very little is known regarding nautilus reproduction in the wild. Observations of captive animals suggest that nautilus reproduce sexually and have multiple reproductive cycles over the course of their lifetime. Based on data from captive *N. belauensis* and *N. macromphalus* individuals, female nautilus may lay up to 10 to 20 eggs per year, which hatch after a lengthy embryonic period of around 10 to 12 months (Uchiyama and Tanabe 1999; Barord and Basil 2014). There is no larval phase, with juveniles hatching at around 22-23 mm in diameter, and potentially migrating to deeper and cooler waters (Barord and Basil 2014); however, live hatchlings have rarely been observed in the wild.

Overall, given the life history traits and physiological habitat constraints of *N. pompilius*, chambered nautilus populations (discussed in more detail below) are extremely susceptible to depletion and vulnerable to local extirpations (CITES 2016).

Analysis of Information Presented in the Petition Along With Information Readily Available in NMFS' Files

The petition contains information on the chambered nautilus, including its taxonomy, morphological characteristics, geographic distribution, habitat, population abundance and trends, and factors contributing to the species' decline. According to the petition, all five causal factors in section 4(a)(1) of the ESA are adversely affecting the continued existence of the chambered nautilus: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors.

In the following sections, we summarize and evaluate the information presented in the petition, which we consider together with information readily available in our files on the status of *N. pompilius*, including demographic factors, and the ESA section 4(a)(1) factors that may be affecting its risk of global extinction. Based on this evaluation, we determine whether a reasonable person would conclude that an endangered or threatened listing under the ESA may be warranted for this species.

Abundance and Population Trends

The global abundance of the chambered nautilus is unknown, with no available historical baseline population data. In fact, the first study to estimate baseline population size and density for the species, in a given area, was only recently conducted by Dunstan *et al.*, (2011a). This study examined the *N. pompilius* population at Osprey Reef, an isolated coral seamount off Australia's northeastern coast, with no history of nautilus exploitation. Based on data collected from 2000 to 2006, the authors estimated that the population at Osprey Reef consisted of between 844 and 4,467 individuals, with a density estimate of 13.6 individuals per square kilometer (km²) (Dunstan *et al.*, 2011a). Subsequent research, conducted by Barord *et al.*, (2014), provided density estimates of nautilus (species not identified) from four locations in the Indo-Pacific: the Panglao region of the Bohol Sea, Philippines, with 0.03 individuals per km², Taena Bank near Pago Pago harbor, American Samoa, with 0.16 individuals per km², the Beqa Passage in Viti Levu, Fiji, with 0.21 individuals per km², and the Great Barrier Reef along a transect from Cairns to Lizard Island, Australia, with 0.34 individuals per km². With the exception of the Bohol Sea, these populations are located in areas where fishing for nautilus does not occur, suggesting that nautilus may be naturally rare, or that other

unknown factors, besides fishing, may be affecting abundance of these species. The authors also indicate that the population estimates from this study may, in fact, be overestimates as they used baited remote underwater video systems to attract individuals to the observation area (Barord *et al.*, 2014). In either case, these very low population estimates suggest that chambered nautilus are especially vulnerable to exploitation, with limited capacity to recover from depletion. This theory is further supported by the comparison between the population size in the Panglao region of the Bohol Sea, where nautilus fishing is occurring, and the unfished sites in American Samoa, Fiji, and Australia, with the Bohol Sea population estimated to be less than 20 percent of the smallest unfished population (Barord *et al.*, 2014).

In terms of current trends in abundance, populations are considered to be stable in areas where fisheries are absent (e.g., Fiji and Solomon Islands), although data to confirm this are lacking (CITES 2016). In the Osprey Reef population discussed above, Dunstan *et al.* (2010) used mark-and-recapture methods to examine the trend in the catch per unit effort (CPUE) of individuals over a 12-year period. Analysis of the CPUE data showed a slight increase of 28 percent from 1997 to 2008, and while this increase was not statistically significant, the results indicate a stable *N. pompilius* population in this unexploited area (Dunstan *et al.*, 2010). However, in locations where fisheries have operated or currently operate, anecdotal declines and observed decreases in catches of nautilus species are reported. Citing multiple personal communications, the 2016 proposal to include the Family Nautilidae in Appendix II of CITES (CITES 2016) noted declines of *N. pompilius* in Indian and New Caledonian waters, where commercial harvest occurred in the past for several decades, and in Indonesian waters, where harvest

is suspected to be increasing. In fact, traders in Indonesia have observed a significant decrease in the number of nautilus collected over the past 10 years, which may be an indication of a declining and depleted population (Freitas and Krishnasamy 2016). In the Philippines, Dunstan *et al.* (2010) estimated that the CPUE of *Nautilus* spp. from four main nautilus fishing locations in the Palawan region has decreased by around 80 percent over a period of less than 30 years. Furthermore, in Tawi Tawi, Cayangacillo, and Tañon Strait/Cebu, Philippines, fisheries that once existed for chambered nautilus have since been discontinued due to the rarity of the species, with Alcala and Russ (2002) noting the likely extirpation of *N. pompilius* from Tañon Strait in the late 1980s. The fact that the species has not yet recovered in the Tañon Strait, despite an absence of nautilus fishing in over two decades, further supports the susceptibility of the species to exploitation and its limited capability to repopulate an area after depletion.

Overall, given the species' natural rarity throughout its range, its presence as small, sparsely distributed, and highly fragmented populations, and its low fecundity and limited dispersal capability, with geographic barriers to movement and strict habitat requirements, we find that even a small number of mortalities could potentially have significant negative population-level effects that may lead to regional extirpations (as may have already occurred in Tañon Strait) and potentially extinction. As such, we find that these current demographic risks could increase the species' vulnerability to present and future threats to the point where the species may be at a risk of extinction and thus warrant further investigation.

Analysis of ESA Section 4(a)(1) Factors

While the petition presents information on each of the ESA section 4(a)(1) factors, we find that the information presented in the petition, together with information readily available within our files, regarding the overutilization of the chambered nautilus for commercial purposes is substantial enough to make a determination that a reasonable person would conclude that this species may warrant listing as endangered or threatened based on this factor alone. As such, we focus our discussion below on the evidence of overutilization for commercial purposes, with comments on the inadequacy of existing regulatory mechanisms to control the exploitation of chambered nautilus, and present our evaluation of the information regarding these factors and their impact on the extinction risk of the species. However, we note that in the status review for this species, we will evaluate all ESA section 4(a)(1) factors to determine whether any one or a combination of these factors are causing declines in the species or likely to substantially negatively affect the species within the foreseeable future to such a point that the chambered nautilus is at risk of extinction or likely to become so in the foreseeable future.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Information presented in the petition and readily available in our files suggests that the primary threat to the chambered nautilus is overutilization for commercial purposes – mainly, harvest for the international nautilus shell trade. Chambered nautilus shells, which have a distinctive coiled interior, are traded as souvenirs to tourists and shell collectors and also used in jewelry and home décor items (where either the whole shell is sold as a decorative object or parts are used to create shell-inlay designs) (CITES 2016). The trade in the species is largely driven by the international demand for their

shells and shell products since fishing for nautilus has been found to have no cultural or historical relevance (Dunstan *et al.*, 2010; De Angelis 2012; CITES 2016; Freitas and Krishnasamy 2016). Nautilus meat is also not locally in demand (or used for subsistence) but rather sold or consumed as a by-product of fishing for the nautilus shells (De Angelis 2012; CITES 2016). While all species of nautilus are found in international trade, *N. pompilius*, being the most widely distributed, is the species most commonly traded (CITES 2016).

Although most of the trade in chambered nautilus originates from the range countries where fisheries exist or have existed for the species, particularly the Philippines and Indonesia, commodities also come from those areas with no known fisheries (such as Fiji and Solomon Islands). Other countries of origin for *N. pompilius* products include Australia, China, Taiwan, India, Malaysia, New Caledonia, Papua New Guinea, Vanuatu, and Vietnam (Freitas and Krishnasamy 2016). Known consumer markets for chambered nautilus products include the Middle East (United Arab Emirates, Saudi Arabia), Australia, Singapore, Malaysia, Indonesia, Philippines, Hong Kong, Russia, Korea, Japan, China, Taiwan and India, with major consumer markets noted in the European Union (Italy, France, Portugal), the United Kingdom, and the United States (Freitas and Krishnasamy 2016). In fact, between 2005 and 2014, the United States imported more than 900,000 chambered nautilus products, comprising at least 104,476 individuals and equating to a little over 1,000 individuals traded annually (CITES 2016). The vast majority of these U.S. imports originated from the Philippines (85 percent of the traded commodities), followed by Indonesia (12 percent), China (1.4 percent), and India (1.3 percent) (CITES 2016).

Because harvest of the chambered nautilus is primarily demand-driven for the international shell trade, with no historical or cultural importance, the intensive nautilus fisheries that develop to meet this demand tend to follow a boom-bust cycle that lasts around a decade or two before becoming commercially nonviable (Dunstan *et al.*, 2010; De Angelis 2012; CITES 2016). Given that the chambered nautilus exists as small, isolated populations, harvest of the species may continue for many years within a region, with the fisheries serially depleting each population until the species is essentially extirpated from that region (CITES 2016). Commercial harvest of the species is presently occurring or has occurred in the Philippines, Indonesia, New Caledonia, Papua New Guinea, and also potentially in China, Palau, Thailand and Vanuatu (CITES 2016). However, based on the number of commodities entering the international trade, it is likely that the Philippines and Indonesia have the largest commercial fisheries for chambered nautilus, with multiple harvesting sites throughout these nations (CITES 2016). Although information on harvest levels and the status of chambered nautilus populations within this portion of its range is limited, the available data, discussed below, do provide evidence of the negative impact of these fisheries and overutilization of the species that speak to the likelihood of its risk of extinction in the future.

As mentioned previously, significant declines of *N. pompilius* have been observed in both the Philippines and Indonesia, primarily a result of overutilization of the species. For example, in 1971, Haven (1972 cited in Haven (1977)) found that Tañon Strait, Philippines, was an abundant source of *N. pompilius*. From 1971 to 1972, around 3,200 individuals were captured for study (Haven 1977). Filipino fisherman also began fishing this location for nautilus shells around this time, with the numbers of fishermen tripling

during subsequent years; however, by 1975, the impact of this harvest on the species was already evident (Haven 1977). Fishermen in 1975 reported having to move operations to deeper water as catches were now rare at shallower depths, and the number of individuals per trap had also decreased (Haven 1977). Additionally, although the number of fishermen had tripled in those 3 years, and therefore fishing effort for the species intensified, the catch did not see an associated increase, indicating a likely decrease in the abundance of the species within the area (Haven 1977). From October to November of 1975, fishermen reported around 220 trapped individuals, a number similar to the 300 individuals caught by Haven (1977) in the month of October in 1971 and prior to the establishment of the nautilus fishery. By the early 1980s, CITES (2016) reports that around 5,000 chambered nautilus were trapped per year in Tañon Strait, but by 1987, the population was estimated to have declined by 97 percent, with the species considered to be commercially extinct and potentially extirpated from the area (Alcala and Russ 2002).

This level of harvest (5,000 chambered nautilus individuals/year), which, based on the information from the Tañon Strait, appears to lead to local extirpations, is being greatly exceeded in a number of other areas throughout the chambered nautilus' range. In Tibiao, Antique province, in northwestern Panay Island, Philippines, del Norte-Campos (2005) estimated annual yield of the chambered nautilus to be around 12,200 individuals for the entire fishery (based on data from 2001-2002). Based on personal communication provided in CITES (2016), in the Palawan, Philippines nautilus fishery, 9,091 nautilus were harvested in 2013 and 37,341 in 2014. This level of harvest is particularly concerning given the significant declines already observed in the Palawan nautilus

fisheries. In four of the five main nautilus fishing areas in this province, Dunstan *et al.* (2010) estimated a decline in CPUE of the species ranging from 70 to 90 percent (depending on the fishing site) over the course of 6 to 24 years. Based on interviews of fishermen, when they began fishing for nautilus, initial harvest in the majority of the fishing sites was estimated to be over 20,000 nautilus/year (Dunstan *et al.*, 2010), a level that was clearly unsustainable for the species and consequently led to significant declines in abundance of the species within these areas. The one main fishing region in Palawan that did not show a decline was the municipality of Balabac; however, the authors note that this fishery is relatively new (active for less than 8 years), with fewer fishermen, and, as such, may not have yet reached the point where the population crashes or declines become evident in catch rates (Dunstan *et al.*, 2010). Given that the estimated annual catches in the Balabac municipality ranged from 4,000 to 42,000 individuals in 2008 (Dunstan *et al.*, 2010), with more recent Palawan harvest levels reportedly over 37,000 in 2014 (CITES 2016), this level of annual harvest, based on the trends from the other Palawan fishing sites (Dunstan *et al.*, 2010), may likely lead to significant population declines in chambered nautilus in the near future, increasing the species' risk of extirpation from this portion of its range. Already, "crashed fisheries" and, hence, severely depleted populations of nautilus have been identified at Tawi Tawi (an island province in southwestern Philippines) and Cagayancillo (an island in the Palawan province) (Dunstan *et al.*, 2010). From the available data in the petition and readily available in our files on the life history of the species, including current trends and evidence of a lack of recovery in populations that have not been fished for over 30 years, we find that present utilization of the species in this portion of its range may have

significant negative effects on the viability of the chambered nautilus populations and, consequently, contribute to an extinction risk that is cause for concern and warrants further investigation.

Overutilization of the chambered nautilus populations off Indonesia may also be a threat contributing to the species' risk of extinction that is cause for concern. Despite Indonesia's current prohibition (implemented in 1999) on the harvest and trade of the species, both domestic and internationally, it is apparent that both are still occurring throughout Indonesia (Nijman *et al.*, 2015; Freitas and Krishnasamy 2016). In fact, based on the increasing number of chambered nautilus commodities originating from Indonesia, it is suggested that nautilus fishing has potentially shifted to Indonesian waters due to depletion of the species in the Philippines (CITES 2016). However, similar to the trend observed in the Philippines, a pattern of serial depletion of nautilus due to harvesting in Indonesia is emerging, with both fishermen and traders noting a significant decline in the numbers of chambered nautilus over the last 10 years (CITES 2016; Freitas and Krishnasamy 2016). For example, fishermen in North Lombok note that they used to trap around 10 to 15 nautilus in one night, but currently catch only 1 to 3 a night (Freitas and Krishnasamy 2016). Similarly, in Bali, fishermen reported nightly catches of around 10 to 20 nautilus until 2005, after which yields have been much less (Freitas and Krishnasamy 2016). While fishing for chambered nautilus has essentially decreased in western Indonesia (likely due to a depletion of the stocks), the main trade centers for nautilus commodities are still located here (i.e., Java, Bali, Sulawesi and Lombok). The sources of nautilus shells for these centers now appears to originate from eastern Indonesian waters (including northeastern Central Java, East Java, and West Nusa

Tenggarra eastward) where it is thought that nautilus populations may still be abundant enough to support economically viable fisheries, and where enforcement of the current *N. pompilius* prohibition appears to be weaker (Nijman *et al.*, 2015; Freitas and Krishnasamy 2016). Data collected from two large open markets in Indonesia (Pangandaran and Pasir Putih) and wholesale traders indicate that chambered nautilus are still being offered for sale as of 2013, with one of the wholesalers noting that he exports merchandise to Malaysia and Saudi Arabia on a bimonthly basis (Nijman *et al.*, 2015). Based on seizure data from 2005 to 2013, over 3,000 chambered nautilus were confiscated by Indonesian authorities (Nijman *et al.*, 2015). Additionally, De Angelis (2012), citing a personal communication, estimated that around 25,000 nautilus specimens were exported from Indonesia to China for the Asian meat market between 2007 and 2010. Given the ongoing demand for chambered nautilus products, the apparent disregard of current prohibition regulations by collectors and traders and lack of enforcement, the observed declining trends in *N. pompilius* fisheries, and the increasing number of nautilus commodities originating from Indonesia, we find that the available information in the petition, together with information readily available in our files, suggest current *N. pompilius* harvest levels within this portion of its range may be contributing to the overutilization of the species and increasing its risk of extinction that is cause for concern.

Active nautilus fisheries also existed and still exist throughout most of the remaining extent of the species' known range, including in India, New Caledonia, Vanuatu, and potentially Papua New Guinea. In India, CITES (2016) states that the chambered nautilus has been exploited for decades. A 2007 survey found the species was

being sold in 20 percent of the major coastal tourist markets in southern India, despite the species being protected from capture and trade by domestic law since 2000 (CITES 2016). In New Caledonia, intensive nautilus fisheries reportedly existed in the past. It is unclear whether commercial fisheries still exist today for the species; however, based on data from 2008, *N. pompilius* shells are still being sold to tourists (CITES 2016). In Vanuatu and Papua New Guinea, targeted chambered nautilus fisheries may be present; however, these fisheries have yet to be investigated (NMFS 2014; CITES 2016). Overall, out of the 11 nations in which *N. pompilius* is known to occur, over half historically or current have targeted nautilus fisheries.

We note that, while the species is afforded some protection in the southern portion of its range, particularly in waters off Australia where there is no commercial harvest for the species (CITES 2016), it is unclear whether these populations may be enough to protect the species from potential extinction throughout all or a significant portion of its range. This conclusion is based on the considerations described above, including the significant uncertainties associated with the species' life history and its high demographic risks, as supported by information presented in the petition together with information readily available in our files. The potential contribution of these populations to the species will be investigated further during the status review of the species.

Although the petition identifies numerous other threats to the chambered nautilus, including habitat degradation, predation, climate change, and ocean acidification, we find that the information presented in the petition, together with information readily available in our files, suggest that overutilization of the species for commercial purposes, in and of itself, may be a threat impacting the chambered nautilus to such a degree that raises

concern that this species may be at risk of extinction presently or in the foreseeable future. Due to the apparent lack of enforcement and the inadequacy of existing regulatory mechanisms, particularly throughout the northern portion of the species' range, the ongoing demand for the species in the international shell trade, the significant demographic risks faced by the species (including extremely low productivity and rare, fragmented, and isolated populations with limited dispersal capability) and the evidence of substantial declines in populations and potential extirpations, we find that present harvest levels and associated mortality may be placing the species at such a risk of extinction that would lead a reasonable person to conclude that *N. pompilius* may warrant listing as a threatened or endangered species throughout all or a significant portion of its range.

Petition Finding

After reviewing the information presented in the petition, and considering information readily available in our files, and based on the above analysis, we conclude the petition presents substantial scientific information indicating that the petitioned action of listing the chambered nautilus as a threatened or endangered species may be warranted. Therefore, in accordance with section 4(b)(3)(B) of the ESA and NMFS' implementing regulations (50 CFR 424.14(b)(3)), we will commence a status review of this species.

During the status review, we will determine whether the chambered nautilus is in danger of extinction (endangered) or likely to become so (threatened) throughout all or a significant portion of its range. We now initiate this review, and thus, *N. pompilius* is considered to be a candidate species (69 FR 19975; April 15, 2004). Within 12 months of

the receipt of the petition (May 31, 2017), the statute requires that we make a finding as to whether listing the chambered nautilus as an endangered or threatened species is warranted as required by section 4(b)(3)(B) of the ESA. If listing is warranted, we will publish a proposed rule and solicit public comments before developing and publishing a final rule.

Information Solicited

To ensure that the status review is based on the best available scientific and commercial data, we are soliciting information on whether the chambered nautilus is endangered or threatened. Specifically, we are soliciting information in the following areas: (1) Historical and current distribution and abundance of this species throughout its range; (2) historical and current population trends; (3) life history in marine environments; (4) historical and current data on nautilus catch and bycatch in industrial, commercial, artisanal, and recreational fisheries worldwide; (5) impacts to known chambered nautilus habitats; (5) data on the trade of chambered nautilus products, including shells, meat, and live specimens; (6) impacts of the ecotourism industry on chambered nautilus behavior and survival; (7) predation rates on chambered nautilus; (8) any current or planned activities that may adversely impact the chambered nautilus or its habitat; (9) ongoing or planned efforts to protect and restore this species and its habitat; (10) population structure information, such as genetics data; and (11) management, regulatory, and enforcement information. We request that all information be accompanied by: (1) Supporting documentation such as maps, bibliographic references, or reprints of pertinent publications; and (2) the submitter's name, address, and any association, institution, or business that the person represents.

References Cited

A complete list of references is available upon request to the Office of Protected Resources (see **ADDRESSES**).

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: August 22, 2016.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs,

National Marine Fisheries Service.

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